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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 42612-2023

Fully-Wrapped Carbon Fiber Reinforced Cylinders with A  
Plastic Liner for the On-Board Storage of Compressed  
Hydrogen as A Fuel for Land Vehicles  
车用压缩氢气塑料内胆碳纤维全缠绕气瓶

(ISO 19881:2018, Gaseous hydrogen - Land vehicle fuel containers, NEQ)

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# Fully-Wrapped Carbon Fiber Reinforced Cylinders with A Plastic Liner for the On-Board Storage of Compressed Hydrogen as A Fuel for Land Vehicles

## 1 SCOPE

This document specifies the types, parameters, categories, and model designation, technical requirements and test methods, inspection rules, and requirements for installation, protection, marking, packaging, transportation, and storage with respect to fully-wrapped carbon fiber reinforced cylinders with a plastic liner for on-board storage of compressed hydrogen for land vehicles (hereinafter referred to as “cylinders”).

This document is applicable to the design and manufacture of the refillable cylinders that are fixed in motor vehicles to store hydrogen fuel, with a nominal working pressure of 35 MPa to 70MPa, a nominal capacity  $\geq 20$  L and  $\leq 450$ L, and a working temperature  $\geq -40^{\circ}\text{C}$  and  $\leq 85^{\circ}\text{C}$ .

Other gas cylinders for hydrogen supply intended for urban rail transit powered by hydrogen fuel cell, hydrogen-powered vessels, hydrogen-powered aircrafts, hydrogen power generation unit, etc. may use this document as a reference.

## 2 NORMATIVE REFERENCES

The following normative documents contain provisions which, through normative reference in this text, constitute essential provision of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendment) applies.

GB/T 223.3	Methods for chemical analysis of iron, steel and alloy-The diantipyryl methane phosphomolybdate gravimetric method for the determination of phosphorus content
GB/T 223.4	Alloyed steel - Determination of manganese content - Potentiometric or visual titration method
GB/T 223.5	Steel and iron - Determination of acid-soluble silicon and total silicon content - Reduced molybdsilicate spectrophotometric method
GB/T 223.11	Iron, steel and alloy - Determination of chromium content - Visual titration or potentiometric titration method
GB/T 223.25	Methods for chemical analysis of iron, steel and alloy-The dimethylglyoxime gravimetric method for the determination of nickel content
GB/T 223.28	Methods for chemical analysis of iron, steel and alloy-The $\alpha$ - benzoinoxime gravimetric method for the determination of molybdenum content
GB/T 223.59	Iron, steel and alloy - Determination of phosphorus content - Bismuth phosphomolybdate blue spectrophotometric method and antimony phosphomolybdate blue spectrophotometric method
GB/T 223.60	Methods for chemical analysis of iron, steel and alloy-The perchloric acid dehydration gravimetric method for the determination of silicon content
GB/T 223.61	Methods for chemical analysis of iron, steel and alloy--The ammonium phosphomolybdate volumetric method for the determination of phosphorus content
GB/T 223.62	Methods for chemical analysis of iron, steel and alloy-The butyl acetate extraction photometric method for the determination of phosphorus content
GB/T 223.63	Iron, steel and alloy - Determination of manganese content - Sodium (potassium) periodate spectrophotometric method
GB/T 223.64	Iron, steel and alloyed - Determination of manganese content - Flame atomic absorption spectrometric method

GB/T 223.68	Methods for chemical analysis of iron, steel and alloy-The potassium iodate titration method after combustion in the pipe furnace for the determination of sulfur content
GB/T 223.72	Iron, steel and alloy - Determination of sulfur content - Gravimetric method
GB/T 223.85	Steel and iron - Determination of sulfur content - Infrared absorption method after combustion in an induction furnace
GB/T 223.86	Steel and iron - Determination of total carbon content - Infrared absorption method after combustion in an induction furnace
GB/T 228.1	Metallic materials - Tensile testing - Part 1: Method of test at room temperature
GB/T 229	Metallic materials - Charpy pendulum impact test method
GB/T 528	Rubber, vulcanized or thermoplastic - Determination of tensile stress-strain properties
GB/T 533-2008	Rubber, vulcanized or thermoplastic - Determination of density
GB/T 1040.1	Plastics - Determination of tensile properties - Part 1: General principles
GB/T 1040.2-2022	Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics
GB/T 1220	Stainless steel bars
GB/T 1458	Test method for mechanical properties of ring of filament-winding reinforced plastics
GB/T 1633-2000	Plastics - Thermoplastic materials - Determination of Vicat softening temperature (VST)
GB/T 1636-2008	Plastics - Determination of apparent density material that can be poured from a specified funnel
GB/T 1677	Determining the epoxy value of plasticizers
GB/T 2941-2006	Rubber - General procedures for preparing and conditioning test pieces for physical test methods
GB/T 3190	Chemical composition of wrought aluminum and aluminum alloys
GB/T 3191	Aluminum and aluminum alloys extruded bars, rods
GB/T 3362	Test methods for tensile properties of carbon fiber multifilament
GB/T 3452.2	Fluid power systems - O-rings - Part 2: Quality acceptance criteria
GB/T 3512	Rubber, vulcanized or thermoplastic - Accelerated ageing and heat resistance tests
GB/T 3682.1-2018	Plastics - Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method
GB/T 4612	Plastics - Epoxy compounds - Determination of epoxy equivalent
GB/T 5720	Test methods for rubber O-rings
GB/T 6031	Rubber, vulcanized or thermoplastic-Determination of hardness (hardness between 10 IRHD and 100 IRHD)
GB/T 7758	Rubber, vulcanized-Determination of low - Temperature characteristics - Temperature-retraction procedure (TR test)
GB/T 7759.1-2015	Rubber, vulcanized or thermoplastic - Determination of compression set - Part 1: At ambient or elevated temperatures
GB/T 7999	Optical emission spectrometric analysis method of aluminum and aluminum alloys
GB/T 9251	Methods for hydrostatic test of gas cylinders
GB/T 9252	Method for pressure cycling test of gas cylinders
GB/T 11170	Stainless steel - Determination of multi-element contents - Spark discharge atomic emission spectrometric method (Routine method)
GB/T 13005	Terminology of gas cylinders
GB/T 13262	Single sampling procedures and tables for inspection having desired operating characteristics by attributes for percent nonconforming
GB/T 13264	Sampling procedures and tables for small lot inspection by attributes for percent nonconforming items
GB/T 13979	Mass spectrometer leak detector

GB/T 15385	Method for hydraulic burst test of gas cylinder
GB/T 15823	Non-destructive testing - Test methods for helium leak testing
GB/T 19466.2	Plastics-Differential scanning calorimetry (DSC) - Part 2: Determination of glass transition temperature
GB/T 19466.3	Plastics-Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization
GB/T 20123	Steel and iron - Determination of total carbon and sulfur content - Infrared absorption method after combustion in an induction furnace (routine method)
GB/T 20975 (all parts)	Methods for chemical analysis of aluminum and aluminum alloys
GB/T 21060-2007	Plastics - Determination of pourability
GB/T 21843	Plastics - Vinyl chloride homopolymer and copolymer resins - Particle size determination by mechanical sieving
GB/T 32249	Aluminum and aluminum-alloy die forgings, hand forgings and rolled ring forgings - General specification
GB/T 33215	Pressure relief devices for gas cylinders
GB/T 37244	Fuel specification for proton exchange membrane fuel cell vehicles-Hydrogen
GB/T 42536	Assembly valve on high pressure hydrogen storage cylinder for vehicles
GB/T 42610	Test method for evaluating hydrogen compatibility of plastic liner of high-pressure gaseous hydrogen cylinders
HG/T 4280	Welding procedure qualification for plastics
JJG 539-2016	Verification Regulation for Digital Indicating Weighing Instruments
NB/T 47010	Stainless and heat-resisting steel forgings for pressure equipment
NB/T 47013.8	Nondestructive testing of pressure equipment - Part 8: Leak Testing
TSG D0001	Pressure Pipe Safety Technology Supervision Regulation for Industrial Pressure Pipe
YS/T 479	Aluminum and Aluminum Alloys Forging for General Industrial Use

### **3 TERMS, DEFINITIONS AND SYMBOLS**

#### **3.1 Terms and Definitions**

For the purpose of this document, the terms and definitions given in GB/T 13005 and the following apply.

##### 3.1.1

plastic liner

inner plastic housing over which carbon fiber reinforced layers are wrapped for sealing gas, and which is not designed to afford any pressure load

##### 3.1.2

seamless plastic liner

plastic liner which is integrally formed and free of any butt joint

##### 3.1.3

welded plastic liner

plastic liner which contains butt joints

##### 3.1.4

thermally-activated pressure relief device (TPRD) end plug

end plug, installed at one end of a cylinder in double-end opening structure, provided with a thermally-activated pressure relief device (hereinafter referred to as "TPRD"), and capable of being plugged automatically

##### 3.1.5

fully-wrapping

A wrapping mode in which the carbon fiber with a resin impregnated matrix is wrapped continuously over the plastic liner in spiral and circumferential pattern so as to reinforce the circumferential and axial strength of the cylinder

##### 3.1.6

fully-wrapped cylinder



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